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In Reply Refer To:

March 3, 1997

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AESO/SE
2-21-96-F-114

John McGee, Forest Supervisor
Coronado National Forest
300 West Congress
Tucson, Arizona 85701

SUBJECT: Biological Opinion for the Proposed Maverick Prescribed Fire, Peloncillo Mountains, Cochise County, Arizona, and Hidalgo County, New Mexico

This biological opinion responds to your request for initiation of formal consultation with the U.S. Fish and Wildlife Service pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended. Your request was dated April 1, 1996, and received by the Service on April 5, 1996. At issue are impacts resulting from the proposed Maverick Prescribed Fire in the Peloncillo Mountains on the Coronado National Forest that may affect the New Mexico ridge-nosed rattlesnake (*Crotalus willardi obscurus*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), and Mexican long-nosed bat (*Leptonycteris nivalis*). The New Mexico ridge-nosed rattlesnake is listed as a threatened species, the lesser long-nosed bat and Mexican long-nosed bat are listed as endangered. Critical habitat has been designated for the rattlesnake species in the Animas Mountains, to the east of the project area in Hidalgo County, New Mexico. Critical habitat has not been designated for the lesser long-nosed bat or Mexican long-nosed bat.

The Forest's request for initiation of consultation also found that the proposed prescribed fire may affect, but not likely to adversely affect the proposed endangered jaguar (*Panthera onca*), endangered Mexican wolf (*Canis lupis baileyi*), endangered ocelot (*Felis pardalis*), endangered jaguarundi (*Felis yagouroundi*), and threatened Mexican spotted owl (*Strix occidentalis lucida*); and would not affect the endangered American peregrine falcon (*Falco peregrinus anatum*), endangered Northern aplomado falcon (*Falco femoralis septentrionalis*), and threatened Cochise pincushion cactus (*Coryphantha robbinsorum*). These findings of may affect, not likely to adversely affect are addressed under the section "CONCURRENCES".

This biological opinion was prepared using information from the following sources: the April 1, 1996, request for initiation of consultation (Coronado National Forest 1996); the biological evaluation (Helbing 1996) and follow-up letters addressing the proposed action; information in our files; and coordination among our staffs and other knowledgeable individuals, including field and office meetings. Literature cited in this biological opinion is not a complete bibliography

of all literature available on the New Mexico ridge-nosed rattlesnake, lesser long-nosed bat, Mexican long-nosed bat, the effects of prescribed fire, or other subjects addressed herein. A complete administrative record of this consultation is on file in this office.

In this biological opinion the Service finds that the effects of the proposed Maverick Prescribed Fire are not likely to jeopardize the continued existence of the New Mexico ridge-nosed rattlesnake, lesser long-nosed bat, or Mexican long-nosed bat. Eleven terms and conditions are described to reduce the possibility of take associated with the proposed action.

CONSULTATION HISTORY

Discussion of this project began in March 1996, during telephone conversations between Gary Helbing (Douglas Ranger District, Douglas, Arizona) and Jim Rorabaugh (Service). This was followed by a field meeting April 24-25, 1996, to review the field sites, including the known localities for the New Mexico ridge-nosed rattlesnake. In attendance at this meeting were Gary Helbing, Andy Holycross (Arizona Game and Fish Department, Phoenix), Charles Painter (New Mexico Department of Game and Fish, Santa Fe), Jim Rorabaugh, and Randall Smith (Forest).

A letter was sent by the Forest initiating formal consultation on the New Mexico ridge-nosed rattlesnake on April 1, 1996, and was received in our office April 5, 1996, with the Biological Assessment and Evaluation (BA) for the proposed Maverick Prescribed Fire. In response to the Forest's April 1, 1996, request for formal consultation and concurrence with specific findings documented in the BA, the Service sent a letter dated June 4, 1996, regarding our non-concurrence with the following species findings: lesser long-nosed bat, Mexican long-nosed bat, Mexican spotted owl, jaguar, Mexican gray wolf, ocelot, and jaguarundi.

A June 5, 1996, letter was received from the Forest which amended the determinations of affects for the Mexican wolf, jaguar, ocelot, and jaguarundi to may affect, not likely to adversely affect for the species or their habitat, and initiated formal consultation on the lesser long-nosed bat and Mexican long-nosed bat.

An August 14-15, 1996, meeting was held at the proposed Maverick Prescribed Fire site and the recently burned Baker Prescribed Burn area to discuss the prescription and possible adverse impacts to listed species. This field meeting was attended by Larry Allen (Forest), Bill Austin (Service), Ron Bemis (Natural Resource Conservation Service, Tucson, Arizona), Gary Helbing, Tricia Roller (Service), Jim Rorabaugh, Joan Scott (Arizona Game and Fish Department, Tucson, Arizona), Randall Smith, Sam Spiller (Service), and Peter Warren (The Nature Conservancy, Tucson, Arizona).

On August 26, 1996, a letter was received from Peter Warren regarding information on the relationship of fire, paniculate agaves (*Agave* spp.) and the foraging behavior of the nectar-feeding long-nosed bats.

On August 26, 1996, the Service responded to the Forest letter of June 5, 1996, and followed up on the field meeting of August 14-15, 1996, and concurred with determinations made by the Forest for the Mexican wolf, jaguar, jaguarundi, and ocelot.

Meetings were held on September 24 and October 21, 1996, to further address specific fire prescription parameters and ignition sites as they relate to New Mexico ridge-nosed rattlesnake and Mexican spotted owl. In attendance of at least one of the two meetings were Larry Allen, Ron Bemis, Carl Edminster (Rocky Mountain Forest and Range Experimental Research Station, Fort Collins, Colorado), Mima Falk (Forest), Jerry Gottfried (Rocky Mountain Forest and Range Experimental Research Station, Fort Collins, Colorado), Gary Helbing, Bruce Palmer (Service), Mary Richardson (Service), Jim Rorabaugh, Randall Smith, and Peter Warren.

On November 7, 1996, the Forest wrote a letter to follow up the September and October meetings and amend the Mexican spotted owl finding of affects in the BA to may affect, not likely to adversely affect for the species or its habitat. The letter also provided information on the burn ignition sites, predicted fire spread, and a description of helicopter flight patterns as they relate to potential Mexican spotted owl habitat.

On January 15, 1997, a meeting of people knowledgeable about nectar-feeding bats, and/or agave ecology was held to discuss agave/nectar-feeding bat relationships, and the potential effects of fire. Baseline information and future potential research regarding fire effects on paniculate agave populations were discussed. Notes on this meeting were distributed by the Forest. The following people attended:

Barbara Alberti	Coronado National Memorial, Sierra Vista, AZ.
Larry Allen	Coronado National Forest, Tucson, AZ.
Bill Austin	Fish and Wildlife Service, Phoenix, AZ.
Ron Bemis	Natural Resource Conservation Service, Tucson, AZ.
Tony Burgess	Biosphere Two Center, Tucson, AZ.
Ginny Dalton	Tucson, AZ.
Carl Edminster	Rocky Mountain Forest and Range Experimental Research Station, Ft. Collins, CO.
Mima Falk	Coronado National Forest, Tucson, AZ.
Dave Gori	The Nature Conservancy, Tucson, AZ.
Michelle Hawks	University of Arizona, Tucson, AZ.
Gary Helbing	Coronado National Forest, Tucson, AZ.
Wendy Hodgson	Desert Botanical Gardens, Phoenix, AZ.
Bruce Palmer	U.S. Fish and Wildlife Service, Phoenix, AZ.
Yar Petryszyn	University of Arizona, Tucson, AZ.
Sheldon Plentovich	U.S. Fish and Wildlife Service, Phoenix, AZ.
Tricia Roller	U.S. Fish and Wildlife Service, Phoenix, AZ.
Joan Scott	Arizona Game and Fish Department, Tucson, AZ.
Peter Scott	Indiana State University, Terre Haute, IN.
Ronnie Sidner	Tucson, AZ.

Tom Skinner	Coronado National Forest, Tucson, AZ.
Liz Slauson	Desert Botanical Gardens, Phoenix, AZ.
Randall Smith	Coronado National Forest, Tucson, AZ.
Peter Warren	The Nature Conservancy, Tucson, AZ.

A meeting was held on January 31, 1997, with Bill Austin, Carl Edminster, Mima Falk, Gary Helbing, Bruce Palmer, Tricia Roller, and Peter Warren to discuss the proposed prescribed fire effects on paniculate agaves as a food resource for *Leptonycteris*.

A February 7, 1997, letter was received by the Service from Carl Edminster to provide a detailed Peloncillo Research Project summary discussed at the January 31 meeting. These studies include issues related to fire effects on paniculate agaves as a food resource for *Leptonycteris*.

A February 13, 1997, letter was provided by the Forest to follow-up the January 31, 1997 meeting which addressed: 1) research measures taken by Rocky Mountain Forest and Range Research Station to determine the effects of prescribed fire across the Peloncillo Mountain landscape which includes effects to agaves and endangered long-nosed bats; 2) prescription parameters and mortality thresholds which would reduce the level of take anticipated with the proposed project; and 3) a monitoring approach established by the Forest to measure the effectiveness of the fire prescription and agave demography.

On February 26,1997, an informal draft copy of the Reasonable and Prudent Measures, Terms and Conditions, and Conservation Recommendations sections of this biological opinion were sent to the Forest upon their request for review.

On February 27, 1997, an informal draft copy of the entire biological opinion requested by and delivered to the Forest for clarification related to their review of the Reasonable and Prudent Measures, Terms and Conditions, and Conservation Recommendations.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The Coronado National Forest proposes the Maverick Prescribed Fire, a prescribed fire on approximately 17,000 acres (6860 hectares) in the Cottonwood Basin, Sycamore Canyon, and Maverick Springs areas of the Peloncillo Mountains, Cochise County, Arizona, and Hidalgo County, New Mexico (Figure 1). A secondary fire line is identified on Figure 1 that indicates a backup line in case the fire escapes the primary line. Approximately 40,000 acres (16,188 hectares) are included within the secondary fire line. The Forest anticipates that approximately 6,000 acres (2428 hectares), all within the primary burn area, will actually be burned. The prescribed fire is part of an ecosystem/forest health initiative that the Forest is implementing within the Peloncillo Mountains in conjunction with the Malapai Borderlands Group (a coalition

Maverick Prescribed Fire

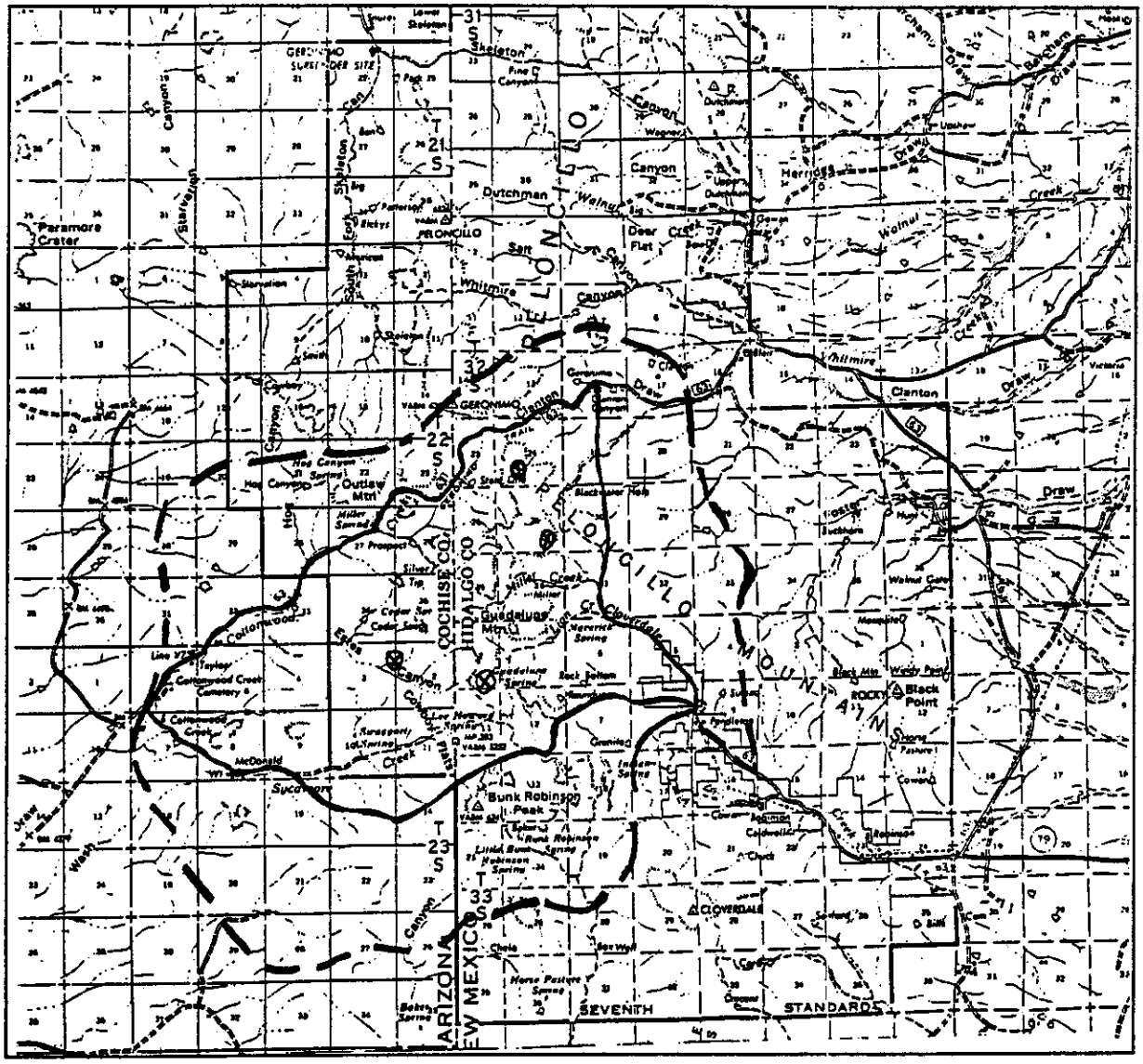

Figure 1. Maverick Prescribed Fire area, Coronado National Forest, Peloncillo Mountains, Cochise County, Arizona and Hidalgo County, New Mexico.

___ Primary burn perimeter (17,000 acres).
---- Secondary burn perimeter (40,000 acres).
X Ignition areas.

of local, private land owners), Natural Resources Conservation Service, and a number of other agencies and parties.

The objectives of the prescribed fire are to: 1) within the ignited perimeter, create a mosaic of burned and unburned fuels with a minimum of 35 percent (6,000 acres, 2428 hectares) of the area burned to a maximum of 60 percent (10,200 acres, 4128 hectares) of the area burned (emphasize control of invading woody plants in Cottonwood Basin); 2) top kill 60 to 70 percent of the half-shrubs on the areas actually burned; 3) top kill 25 to 40 percent of velvet mesquite less than four inches in diameter within areas actually burned (target of 60 percent top kill for Cottonwood Basin); 4) top kill 40 to 50 percent of junipers less than six inches in diameter within the area actually burned (target of 60 percent in Cottonwood Basin); 5) limit fire in riparian areas to low intensity burning; and 6) enhance interagency/landowner cooperation to implement coordinated management plans.

The fire is scheduled for late May or June, 1997. If conditions do not allow for fire ignition in 1997, the fire would be rescheduled for 1998. If the fire escapes the primary fire line, no suppression activities would be initiated. However, if the fire crosses the secondary line, it would be suppressed as necessary to prevent resource or property damage, or for safety issues. Fire lines are either roads (such as Geronimo Trail) or natural breaks in the fuel, such as rock outcrops or ridgelines with little vegetation. Their effectiveness as fire breaks will vary considerably and depend on a variety of factors, such as the density and flammability of fuels, the climatic conditions during the fire; and slope, aspect, width, and continuity of the fire line. Fuels in the project area are patchy. The fire would likely not burn in areas with little fuel and flare up in others. The fire would be ignited in four areas (Figure 1) with flammable materials dropped from a helicopter. All ignition sources are on or near ridge-tops which allows for a "backing fire" which are often slower moving fires, because the flame tip is bent away from the new fuels with up-slope air movement during the day-time period of the diurnal cycle when temperatures are highest and fuels are most combustible. This burning technique also allows for the up-slope movement of smoke (Pyne 1984).

Proposed Mitigation Measures

The following mitigation measures are included as part of the original project description (Coronado National Forest 1996) or were agreed to by the Forest to be included as part of the project description at subsequent meetings.

1. The upper Miller Canyon area, where most localities of the New Mexico ridge-nosed rattlesnake occur in the Peloncillo Mountains, would not be an ignition site.

2. No new roads or fire breaks will be bladed.

3. Before July 15, a decision to ignite the fire shall not occur within 7 days of any rainfall event in the primary or secondary fire areas. If rainfall occurs after

a decision to mobilize the fire effort but before ignition, the fire shall be ignited only if the effort cannot be halted without significant expense.

4. The fire shall not be ignited after July 14.

5. Burned areas above 1,700 meters shall be rested from grazing during the first two summer growing seasons (July, August, and September) following the fire.

6. The ignition sites will be placed one mile away from potential Mexican spotted owl habitat along a ridge-top where fire spread will likely move in an opposite westward direction. The specific type of fire likely to move in a direction toward the potential habitat is a backing fire. The chance of a backing fire to spread across a one mile distance is insignificant and discountable.

7. Prescription parameters used to characterize the percent burned area will be set to achieve 35 percent and will not be greater than 60 percent.

8. Mortality thresholds across samples measuring paniculate agaves within the prescribed burn area will not go past 20 percent.

STATUS OF THE SPECIES

New Mexico Ridge-nosed Rattlesnake

The New Mexico ridge-nosed rattlesnake is a small (maximum of 626 mm total length) montane species known only from the Animas Mountains, Hidalgo County, New Mexico, Peloncillo Mountains, Hidalgo County, New Mexico and Cochise County, Arizona; and the Sierra San Luis, Sonora and Chihuahua, Mexico (Degenhardt *et al.* 1996, Painter 1995, Campbell *et al.* 1989, Andy Holycross, Arizona Game and Fish Department, Phoenix, Arizona, pers. comm. 1996). The subspecies is represented by a single specimen from Arizona, collected in Skeleton Canyon of the Peloncillo Mountains on October 24, 1996. The subspecies may also occur in the Sierra Pulpita in Chihuahua (Barker 1991). New Mexico ridge-nosed rattlesnake is one of five subspecies of the ridge-nosed rattlesnake found from montane areas of southeastern Arizona and southwestern New Mexico, south through the Sierra Madre to Zacatecas, Mexico. *C. w. obscurus* is closely related to *C. w. silus*, but the two can be distinguished based on a variety of scalation and coloration traits; the two are also distinct biochemically (Harris and Simmons 1976, Barker 1991).

The New Mexico ridge-nosed rattlesnake is typically found in steep, rocky canyons with intermittent streams or on talus slopes at elevations ranging from approximately 1,700 to 2,600 meters (5,570 to 8,500 feet) (Degenhardt *et al.* 1996, Painter 1995, Campbell *et al.* 1989, Barker 1991). The subspecies is found in areas of Madrean evergreen woodland and Petran montane conifer forest (Pase and Brown 1982, Brown 1982). Dominant vegetation characterizing the habitat of this subspecies includes several species of oak (*Quercus* spp.),

Douglas fir (*Pseudotsuga menziesii*) Apache pine (*Pinus engelmannii*), Chihuahua pine (*P. leiophylla* var. *chihuahuana*), Arizona madrone (*Arbutus arizonica*), manzanita (*Arctostaphylos pungens*), and grasses (Degenhardt *et al.* 1996, Degenhardt 1972, Barker 1991). Access to rock shelters with moderate interstitial spaces is probably a key habitat component (Barker 1991); however, the subspecies also uses perennial bunch grasses for cover (Painter 1996). New Mexico ridge-nosed rattlesnakes apparently move less frequently, move relatively short distances, and show high fidelity to specific rock shelter sites as compared to other rattlesnake species (Holycross 1995a and 1995b, Barker 1991).

Young snakes are live born probably in late June through August (Holycross 1995b, Painter 1995). Mean litter size for 12 broods was 5.5 (Applegarth 1980). Fecal samples from 12 New Mexico ridge-nosed rattlesnakes captured in the Sierra San Luis contained rodent hairs, lizard scales, and parts of large centipedes (*Scolopendra* spp.) (Barker 1991). Applegarth (1980) reported that the diet of *C. willardi* includes a variety of items, including rodents, birds, lizards, snakes, and arthropods. Barker (1991) suggests that *C. w. obscurus* tends to feed on rodents whereas *C. lepidus* feeds primarily on lizards and centipedes.

The New Mexico ridge-nosed rattlesnake was listed as a threatened species by the Service in an August 4, 1978, Federal Register notice (43 FR 34479). Critical habitat was also designated in Bear, Spring, and Indian canyons of the Animas Mountains between 1,890 and 2,600 meters (6,048 to 8,320 feet) elevation. At the time of listing the subspecies was not known to occur in the Peloncillo Mountains. The subspecies occurs in three (or more), small disjunct populations. As a result, its viability is sensitive to habitat destruction or modification, and collection. After publication of the Animas locality in 1961 (Bogert and Degenhardt 1961), the area was reportedly heavily collected. Harris and Simmons (1975) reported encountering 15 collectors from six states during August 1974, in the Animas Mountains. The Service (1985) estimated that as many as 130 New Mexico ridge-nosed rattlesnakes may have been collected in the Animas Mountains between 1961 and 1974. Collection during this time period may have significantly impacted the Animas population (Harris and Simmons 1975, Service 1985). The Animas Mountains are privately owned and access to habitat areas is now strictly controlled. However, much of the habitat of the ridge-nosed rattlesnake in the Peloncillo Mountains is managed by the Coronado National Forest and Bureau of Land Management, and is open to public use, thus providing more of an opportunity for illegal collecting. Fire and overgrazing may adversely affect the habitat of this subspecies (Barker 1991, Service 1985), and mining, development, and logging are potential threats (Service 1985).

Further information on the taxonomy, range, distribution, biology, and threats to the New Mexico ridge-nosed rattlesnake can be found in Painter (1995), Holycross (1995), Applegarth (1980), Barker (1992), Campbell *et al.* (1989), Degenhardt *et al.* (1996), and Degenhardt (1972).

Lesser Long-nosed Bat

The lesser long-nosed bat was listed (originally, as *Leptonycteris sanborni*; Sanborn's long-nosed bat) as endangered on September 30, 1988 (53 FR 38456). No critical habitat has been designated for this species. The lesser long-nosed bat is a small, leaf-nosed bat. It has a long muzzle and a long tongue, and is capable of hover flight. These features are adaptations to feed on nectar from the flowers of columnar cactus, such as the saguaro (*Carnegia gigantea*) and organ pipe cactus (*Lemaireocereus thurberi*), and from paniculate agaves, such as Palmer's agave (*Agave palmeri*) and Parry's agave (*A. parryi*) (Hoffmeister 1986). Palmer's agave exhibit many characteristics of chiropterophily, such as nocturnal pollen dehiscence and nectar production, light colored and erect flowers, strong floral order, and high levels of pollen protein with relatively low levels of nectar sugar concentrations (Slauson 1996). Parry's agave demonstrates many (though not all) of these same morphological features (Gentry 1982). Slauson (1996) has demonstrated that nectar feeding bats are the principle pollinators defining seed set in Palmer's agave, though other pollinators my also be important.

The lesser long-nosed bat is migratory and found throughout its historic range, from southern Arizona and extreme southwestern New Mexico, through western Mexico, and south to El Salvador. It occurs in southern Arizona from the Picacho Mountains (Pinal County) southwest to the Agua Dulce Mountains (Pima County) and southeast to the Chiricahua Mountains (Cochise County) and south to Mexico. Roosts in Arizona are occupied from late April to September (Cockrum and Petryszyn 1991); the bat is not known to be present during winter in Arizona (Hoffmeister 1986). In spring, adult females, most of which are pregnant, arrive in Arizona gathering into maternity colonies. These roosts are typically at low elevations near concentrations of flowering columnar cacti. After the young are weaned these colonies disband, in July and August; some females and young move to higher elevations, primarily in the southeastern parts of Arizona near concentrations of blooming paniculate agaves. Adult males typically occupy separate roosts forming bachelor colonies. Males are known mostly from the Chiricahua Mountains but also occur with adult females and young of the year at maternity sites (Fleming 1994).

As indicated above, the lesser long-nosed bat consumes nectar and pollen of paniculate agave flowers and the nectar, pollen, and fruit produced by a variety of columnar cacti. These bats often forage in flocks. Throughout the night between foraging bouts the bats will rest in temporary night roosts (Hoffmeister 1986). Nectar of these cacti and agaves are high energy foods. Concentrations of food resources appear to be patchily distributed on the landscape and the nectar of each plant species utilized is only seasonally available. Cacti flowers and fruit are available during the spring and early summer, and blooming agaves through the summer; cacti occur in lower elevation areas of the Sonoran Desert region, and paniculate agaves are found in higher elevation desert areas, desert grasslands and shrublands, and into the oak woodland (Gentry 1982).

Lesser long-nosed bats appear to be opportunistic foragers and efficient fliers. The seasonally available food resources may account for the seasonal movement patterns of the bat. The lesser

long-nosed bat is known to fly long distances from roost sites to foraging sites. Night flights from maternity colonies to flowering columnar cacti have been documented in Arizona at 15 miles, and in Mexico at 25 miles and 38 miles (Virginia Dalton, Tucson, Arizona, pers. comm. 1997; Yar Petryszyn, University of Arizona, Tucson, pers. comm. 1997). Lesser long-nosed bats have been recorded visiting individual blooming Palmer's agaves in excess of 1000 visits per night (Ronnie Sidner, Tucson, Arizona, pers.comm. 1997), while other agaves may not be visited at all (Liz Slauson, Desert Botanical Gardens, Phoenix, Arizona, pers. comm. 1997). Lesser long-nosed bats have been observed feeding at hummingbird feeders many miles from the closet potential roost site (Yar Petryszyn, pers. comm. 1997).

Loss of roost and foraging habitat, as well as direct taking of individual bats during animal control programs, particularly in Mexico, have contributed to the current endangered status of the species. Suitable day roosts and suitable concentrations of food plants are the two resources that are crucial for the lesser long-nosed bat (Fleming 1994). Caves and mines are used as day roosts. The factors that make roost sites useable have not yet been identified. Whatever the factors are that determine selection of roost locations, the species appears to be sensitive to human disturbance. Instances are known where a single brief visit to an occupied roost is sufficient to cause a high proportion of lesser long-nosed bats to temporarily abandon their day roost and move to another. Perhaps most disturbed bats return to their preferred roost in a few days. However, the sensitivity suggests that the presence of alternate roost sites may be critical when disturbance occurs. Interspecific interactions with other bat species may also influence lesser long-nosed bat roost requirements.

Known major roost sites include 16 large roosts in Arizona and Mexico (Fleming 1994). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy these sites was greater than 200,000. Twelve major maternity roost sites are known for Arizona and Mexico. According to the same surveys, the maternity roosts are occupied by over 150,000 lesser long-nosed bats. The numbers above indicate that although there may be relatively large numbers of these bats known to exist, the relative number of known large roosts is small. Disturbance of these roosts and the food plants associated with them could lead to the loss of the roosts. The limited numbers of maternity roosts may be the critical factor in the survival of this species.

Mexican Long-nosed Bat

The Mexican long-nosed bat was listed as endangered on September 30, 1988 (53 FR 38456). No critical habitat has been designated for this species. The Mexican long-nosed bat is a medium-sized bat with an elongated snout and a small, prominent, triangular noseleaf on the tip. These bats have a long, protruding tongue with inward-pointing, elongated papillae at the tip. Long-nosed bats feed on nectar and pollen of agave and cactus flowers, some soft fruits, and perhaps, incidentally, insects associated with flowers. Diagnostic characters include the long snout and tongue, minute tail, and hairs extending beyond the edge of the interfemoral membrane.

Mexican long-nosed bats are known within the elevation range of 500 meters (1,550 feet) to 3,000 meters (9,300 feet) from northern and central Mexico, southwestern Texas, and southwestern New Mexico. They inhabit desert scrub, open conifer-oak woodlands, and pine forest habitat. The species is colonial and usually roosts in caves, but can also be found in mines, culverts, and hollow trees. There are no references in the literature to roosts that are occupied year-round nor whether seasonally occupied roosts are occupied by the same colony when they return. A particular colony may use one or more winter roosts, several migratory roosts, and still other summer roosts. Food resource availability probably drives this species' migratory movements which might be tied to taking advantage of peaking floral food sources. For example, the species' use of a roost in Big Bend National Park may reflect use in years when flower production is low in Mexico. Possible food plants include columnar cacti such as the cardon (*Pachycereus pringlei*) and paniculate agave species. The migratory path and nature of the species is not well known.

The current population size is difficult to estimate. Mexican long-nosed bat populations appear to have dramatically decreased during the last three decades. A 1985 survey of 14 known roost sites resulted in a determination of very small numbers of this species. Causes of the decline have not been identified with complete certainty, but they probably relate to human activities. Modification or destruction of roost sites and foraging habitat are probably the major threats. Other threats may include pesticides, competition for roosts and nectar, natural catastrophes, disease, and predation. As with other colonial roosting bats, Mexican long-nosed bats are probably limited by the number of sites that provide the proper roosting environment, especially for parturition. While no known Mexican long-nosed bat roosts have been rendered unusable, in general, roosting caves are becoming increasingly subject to human destruction and disturbance. This species is particularly sensitive to perturbation of the roost. Foraging habitat disruption and destruction has also been identified as a threat. Foraging habitat can be modified or destroyed by harvesting of agave, expansion of agriculture, and other land uses.

ENVIRONMENTAL BASELINE

Project Location and General Vegetation Communities:

The Maverick Prescribed Fire is proposed for the southern portion of the Peloncillo Mountains, Cochise County, Arizona, and Hidalgo, County, New Mexico. The primary area targeted for the fire lies south of Forest Service Road 63, north of Sycamore Creek, and west of Maverick Spring. The area is characterized by hilly and mountainous terrain with several major drainages, including Cottonwood Creek, Miller Creek, Estes Canyon, and Lion Creek. The vegetation of lower slopes is characterized by shrubs and grasses, with mesquite (*Prosopis* spp.), juniper (*Juniperus* spp.), whitethorn acacia (*Acacia constricta*); and various perennial grasses predominating. In the higher elevations, pinyon pine (*Pinus edulis*), Apache pine, Chihuahua pine, and oaks are more abundant. Woodlands are present and best represented near Bunk Robinson Peak (in the secondary burn area), and in Clanton Draw (primary and secondary burn areas). Riparian vegetation is found in Clanton Draw, Cottonwood Canyon, at numerous springs, and other sites, and includes Arizona ash (*Fraxinus velutina*), Arizona sycamore

(*Platanus racemosa* var. *wrightii*), Fremont cottonwood (*Populus fremontii*), mesquite, and netleaf hackberry (*Celtis laevigata*).

Brown (1982) has estimated the semi-desert grassland maximum elevation range limit as 1900 meters (6,080 feet). Elevations in the primary burn area range from approximately 1,370 meters (4,495 feet) near Cottonwood Creek School to 1,970 meters (6,462 feet) at Guadalupe Mountain. McPherson (1992b) reported oak woodland stands occurring between 1,160 meters (3,712 feet) and 2,320 meters (7,424 feet), with the majority of stands found between 1,400 meters (4,480 feet) and 1,800 meters (5,760 feet). Therefore, this proposed project appears to be primarily located in what has been referred to as oak savanna, the upper elevational limits of the transition between desert grassland and oak woodland. Oak woodlands are also included in the project area.

Riparian areas in southeastern Arizona, at similar elevations and within the oak savanna and woodland zone, have been documented as supporting up to 72 bird species, including 41 neotropical migratory birds (Block *et al.* 1992). Brown (1982) has also listed 19 reptile and mammal species typically present in these communities. Clanton Draw, a deep canyon with riparian vegetation, exhibited an abundance and diversity of understory vegetation, and has a multi-structural gallery forest with very large trees. These riparian communities are a relatively important component of the southeastern Arizona landscape and supports a unique composition of plant species with greater structural complexity compared to adjacent communities (Snyder 1996) with an expected related distinctive assemblage of wildlife species.

There is little question regarding the fact that fire has historically been a component of semi-desert grasslands and oak woodlands. However, evidence of fire intervals can only be inferred from adjacent forest communities or historical newspaper accounts. Fire return intervals in the desert grassland community have been estimated at approximately 8 to 20 years (Wright and Baily 1982, McPherson 1995, Kaib *et al.* 1996). Natural fire has been excluded from this and other areas of southeastern Arizona and southwestern New Mexico, primarily as a result of livestock overgrazing and drought which removed fine fuels, and past fire suppression. Lack of natural fires and overgrazing have resulted in encroachment or increased density of woody species such as mesquite and juniper, and various half-shrub woody species. There has also been a reduction in coverage of perennial grasses. This conversion of grasslands to shrublands has reduced available forage for livestock and some wildlife species with an increase in runoff and soil erosion. The goals of the prescribed fire are to: 1) restore historic biodiversity through reduction of density of woody species; 2) apply the principles of ecology-based multiple use management; 3) restore historical habitat characteristics to improve wildlife diversity with an emphasis on threatened, endangered, and sensitive species; 4) improve watershed stability and hydrologic function through improved herbaceous plant cover; and 5) create a mosaic that will allow fire to resume a more natural role in ecosystem function (Helbing 1996).

It has been noted by Clark (1990) that "long-term fire regime (i.e. vegetation pattern and associated fire behavior) is probably more a consequence than a cause of vegetation patterns, at

least at a coarse level of resolution." McPherson (1995) noted that "vegetation probably affects fire regime to a greater extent than fire regime affects vegetation."

Exotic grasses, particularly Lehmann lovegrass (*Eragrostis lehmanniana*), and, at lower elevations of the oak woodland, buffelgrass (*Cenchrus ciliaris*), have been documented at a similar elevation range in frequently burned areas at Fort Huachuca Military Base near Sierra Vista, Arizona (McPherson 1992). Fire creates an environment open to high levels of sun light in which Lehmann lovegrass seeds readily germinate, as well as regrow from underground decumbant tillers. Thus the exotic grass responds positively following fire, suggesting that burning in areas where these exotic species occur will serve to fuel future fires and increase the abundance and spread of these exotic grasses. Future changes in fire behavior (i.e.fire intensity and spread), fire frequency, and associated fire effects may increase with burning (Anable 1992, McPherson 1995).

Exotic species invasion may influence fire effects on native species diversity. Black grama (*Bouteloua eripoda*) is a native grass which has been documented as being significantly reduced following fire in continuous stands of Lehmann lovegrass. Mortality of the endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) following fire in dense stands of Lehmann lovegrass is significantly greater than in communities characterized by native species (Roller and Halvorson, in press). Significantly more native species of invertebrates, mammals, plants, and birds were abundant in plots of native semi-desert grasslands than in plots dominated by Lehmann lovegrass in southern Arizona (Bock *et al.* 1986). Lehmann lovegrass and other exotic species produce a greater abundance of fine fuel (McPherson 1995), and grow in continuous distributions compared to native species (Roller and Halvorson, in press), which could likely increase the fire spread and fire intensity in a semi-desert grassland burn (Wright and Baily 1982). Thus, with the presence of certain exotic species, fire will likely influence the community differently than under past conditions.

Currently, there is no documentation of the presence of Lehmann lovegrass or buffelgrass from the Maverick Prescribed Fire area.

Status of the Listed Species in the Project Area:

New Mexico Ridge-nosed Rattlesnake

The New Mexico ridge-nosed rattlesnake was first discovered in the Peloncillo Mountains in 1987 (Campbell *et al.* 1989). A total of nine ridge-nosed rattlesnakes have been found from three areas, including five snakes from upper Miller Canyon and a nearby canyon, three snakes from Cottonwood Canyon and just north of Cottonwood Canyon, and a single snake from Skeleton Canyon. An apparent hybrid between *C. w. obscurus* and *C. lepidus* was reported by Campbell *et al.* 1989, but the precise collection locality is unknown. Six of the nine ridge-nosed rattlesnakes have been found within the primary burn area. Two others, found just north of Cottonwood Canyon near the Arizona-New Mexico border, were found in the secondary burn area. Three snakes were found in a single, large pile of woody debris in Miller Canyon. In the

Peloncillo Mountains, the New Mexico ridge-nosed rattlesnake has been found from 1,700 to 1,890 meters (5,570 to 6,200 feet) elevation. Despite intensive and extensive searches by numerous individuals, no other specimens have been found.

In the Animas Mountains in 1995, the encounter rate for ridge-nosed rattlesnake was one per 4.4 person-days of search time (Holycross 1995b). In 1995, no ridge-nosed rattlesnakes were encountered by Holycross (1995b) in the Peloncillo Mountains despite 46 person-days of search time. The distribution of the subspecies in the Peloncillo Mountains is as yet unclear. However, occurrence is likely very patchy, habitat is probably limited, and the rattlesnake may occur in lower densities within those habitats as compared to the Animas Mountains.

Threats to the New Mexico Ridge-nosed Rattlesnake and Its Habitat Specific to the Project Area:

A general listing of threats to the New Mexico ridge-nosed rattlesnake that contribute to its status as a threatened species is found in the section "Status of the Species" above. This general listing applies to the project area, but public access in the Peloncillo Mountains makes illegal collection a more important threat than elsewhere in the range of the snake. Also, the likely small size and possible disjunct nature of populations in the Peloncillo Mountains make animals in the project area especially vulnerable to habitat degradation and collection.

Prescribed fire is rapidly becoming a valuable tool for land managers to improve rangelands and restore native grassland communities. The Malapai/Borderlands Ecosystem Plan, currently in preparation, is expected to recommend prescribed fire as a vegetation management tool for a 750,000-acre planning area that includes the Animas and Peloncillo mountains (Coronado National Forest 1996). Without prescribed fire, increasing fuel loads in woodlands and shrublands will inevitably lead to large wildfires in the future. Thus, fire, whether it is natural or prescribed, will certainly occur periodically throughout the range of the New Mexico ridge-nosed rattlesnake.

In the Peloncillo Mountains in 1994, a wildfire burned approximately 24,000 acres in the Sycamore Canyon area and smaller fires burned near Maverick Spring (900 acres) and Cloverdale Creek (800 acres) (Allen 1994). These fires burned the upper portions of Miller Canyon and adjacent areas where five ridge-nosed rattlesnakes have been found. In this area, the fire was very patchy, and burned predominantly on the south-facing slope of Miller Canyon. Brush on the north-facing slope was mostly untouched by the fire. However, fuel loads on the north slope are relatively high and could burn very intensely.

A wildfire burned through a New Mexico ridge-nosed rattlesnake study site in the Sierra San Luis, Chihuahua, in June and July, 1991. Barker (1991) reported that the fire was extremely hot and intense. Almost all vegetation was consumed, rock piles were broken apart or covered with silt deposited from eroding hillsides, and boulders were split open from the intense heat. The encounter rate of ridge-nosed rattlesnakes decreased after the fire, no animals marked before the fire were recaptured after the fire, a routinely monitored snake that was equipped with a

transmitter vanished after the fire, and one of six individuals captured after the fire exhibited burns on its dorsum. However, at least two telemetered ridge-nosed rattlesnakes survived the fire, including one in an area that apparently burned especially hot. Barker (1991) suggested that snakes that survived the fire may have been more subject to predation as a result of reduced cover. In a burned area he observed a zone-tailed hawk (*Buteo albonotatus*) flying with a small snake in its talons that may have been a ridge-nosed rattlesnake. These observations suggest that the direct and indirect effects of the fire probably resulted in increased mortality of snakes. However, the degree to which mortality increased cannot be quantified.

Other species of rattlesnakes are known to be killed during fires. Jeff Howland (Arizona Game and Fish Department, Phoenix, Arizona, pers. comm. 1996) reported finding a dead western diamondback rattlesnake (*Crotalus atrox*) that was apparently killed by a wildfire in the McDowell Mountains near Phoenix. Todd Esque (National Biological Service, St George, Utah, pers. comm. 1996) found a gopher snake (*Pituophis melanoleucus*) and a tiger rattlesnake *Crotalus tigris*) apparently killed by wildfire in the Pusch Ridge fire (Santa Catalina Mountains, Arizona) and the Rock Peak fire, San Tan Mountains, Arizona, respectively.

Lesser Long-nosed Bat

There are no known roosts of the lesser long-nosed bat in the Maverick project area. Potential roost sites within the project area have been investigated by Forest personnel and inquiry made of knowledgeable individuals to the presence of possible lesser long-nosed bat or Mexican long-nosed bat roosts in the general area. Paniculate agaves, primarily Palmer's agave and Parry's agave, occur within the project area, often in areas of dense concentrations as well as scattered across the landscape. Agaves are important food resources for the long-nosed bats, especially at specific times of the year. The extent of use of the area as foraging habitat by the lesser long-nosed bat is not known. A night roost of unknown but suspected nectar-feeding bat species was known to occur in an abandoned building within the Peloncillo Mountains in the vicinity of the nearby Baker burn (Gary Helbing, Douglas Ranger District, Douglas, Arizona, pers. comm. 1996). That building has since been destroyed. Although there are no day roosts known within the project area, there are occupied roosts in the Chiricahua and Animas mountains. The Maverick project area is within foraging distance of these known roosts and there may be other potential roost sites within foraging distance of the project area. This, and the presence of the one known night roost of nectar-feeding bats, suggests that the agaves within the project area may be used by long-nosed bats, and it is possible that the foraging habitat within the project area may be of importance at some time, in some years, in the foraging activity of *Leptonycteris* that occur in the general area.

Mexican long-nosed bat

Two specimens taken in Hidalgo County (in 1963 and 1967) in southwestern New Mexico were recently determined to be Mexican long-nosed bat (U.S. Fish and Wildlife Service 1994). The species presence was recently confirmed when individuals were netted over a tank in Hidalgo County on August 26, 1992. However, a roost site has not been located and the status of the

New Mexico population has not been determined. The New Mexico locality is over 400 miles disjunct from the Texas locality and over 437 miles from the northernmost record in central Sinaloa. The capture location of the above individuals is relatively close to the project area.

EFFECTS OF THE PROPOSED ACTION

The Service is committed to large-scale, ecosystem based management. Prescribed fire is an extremely important management tool needed to enhance, and often to restore many of the ecosystem functions and processes. Land management decisions should consider the long-term benefits of management actions which result in the maintenance of natural communities. In many cases, altered landscapes, reduction in habitat, and various habitat-based threats have contributed to the listing of many endangered and threatened species. To recover listed species requires addressing these habitat concerns. The long-term benefits of many land management actions may contribute, in the short-term, to certain adverse affects to listed species. Prescribed burn projects may often fall into this category. Such species whose habitats have been reduced, degraded, or altered may currently respond to fire differently then they did historically when fire occurred in a natural setting. Therefore, it is important to address such concerns by minimizing, to the greatest extent practical, those short-term adverse affects, and move forward with proactive land management as prescribed fire is applied in efforts to restore ecosystem functions and community dynamics.

New Mexico Ridge-nosed Rattlesnake

Effects of the proposed Maverick Prescribed Fire on the New Mexico ridge-nosed rattlesnake can be segregated into three categories: 1) direct effects of the fire on individual snakes (snakes burned in the fire), 2) habitat destruction or degradation caused by the fire, and 3) habitat destruction or degradation, or direct mortality of ridge-nosed rattlesnakes caused by fire suppression activities if the fire crosses the secondary fire line.

Direct Effects to New Mexico Ridge-nosed Rattlesnakes:

As exhibited in the Sierra San Luis fire, New Mexico ridge-nosed rattlesnakes may be killed or injured during a fire by heat and flames, although the percentage of individuals affected and the impact on the population cannot be quantified. The San Luis fire was especially hot, incinerating vegetation and breaking rocks. The fire that burned through Miller Canyon in 1994 left many trees standing and unharmed and no evidence of severe erosion or sedimentation was apparent. Throughout much of the proposed primary and secondary burn areas fuels are light or patchy. However, the fire would likely burn hot in specific areas where fuel loads are great. Also, fuels could be very dry in May or June and could burn relatively hot. However, because fuel loads are generally light and patchy, even with relatively dry conditions a fire of the intensity and destructive nature of the San Luis fire is not expected in the Maverick fire.

Nevertheless, ridge-nosed rattlesnakes may be killed in the fire. Snakes would most likely be affected if they were active on the surface or in a shelter site of flammable materials. Three of

the ridge-nosed rattlesnakes found in the Peloncillo Mountains were found in a single woody debris pile in Miller Canyon. Such refugia could burn hot and rapidly, killing or injuring snakes. However, in fire hot spots, even the cover of a boulder pile or talus slope may not be adequate, as demonstrated during the Sierra San Luis fire, in which the heat of the fire broke boulders and rock piles apart (Barker 1991).

Table 1 summarizes ridge-nosed rattlesnake encounter data for the Animas Mountains in 1994 and 1995 (Holycross 1995a, 1995b). Because animals were found by Holycross at or near the surface rather than by turning logs or disturbing rock piles, the number of *C. w. obscurus* found per day suggest relative monthly activity by ridge-nosed rattlesnakes. These data suggest that the snakes would be relatively inactive during late May or June. During this time the snakes are primarily in rock shelters. The effects of fire during this period would be ameliorated because these shelter sites would provide some protection from heat and flames. Snakes become active with the onset on the summer rains, typically in July. During periods of activity (from the summer rains through November) (Charles Painter, pers. comm. 1996; Andy Holycross, pers. comm. 1996), the snakes often use bunch grasses, such as mountain muhly (*Muhlenbergia montana*), and leaf litter for cover (Holycross 1996). Mortality and injury of snakes would likely be much greater during these times.

Table 1. Catch per unit effort of New Mexico ridge-nosed rattlesnakes in the Animas Mountains, 1994-1995 (Holycross 1995a, 1995b).

Month	#days search time	*#C. w. obscurus* found	*#C. w. obscurus*/day
April	42	2	.048
May	45	7	.156
June	66	3	.045
July	63	12	.190
August	70	20	.286
September	65	20	.308
October	105	24	.229

Holycross (1996) noted that rainfall during the dry season (May and June) will bring snakes to the surface, so that even during these months of relative inactivity, mortality could be high if the fire occurs shortly after a storm. Andy Holycross and Charlie Painter during discussions with the Service and the Forest about the Maverick fire suggested that mortality could be minimized by not igniting the fire after July 15 and, before July 15, not igniting the fire within 10 days of measurable rainfall in the primary or secondary burn areas.

Habitat Destruction or Degradation Caused by the Fire:

Fire would be expected to alter habitats of the New Mexico ridge-nosed rattlesnake dramatically in the short term. During the fire, vegetation cover, woody debris piles, and leaf litter in which snakes take refuge may be reduced or eliminated. Experience in the Sierra San Luis fire suggests that in hot spots rocks may be broken and talus or rock piles may be covered with sediment from eroding hillsides. Taken together, these effects will likely reduce potential cover sites for the ridge-nosed rattlesnake, at least temporarily. Reduced cover may leave snakes more vulnerable to predation (Barker 1991). Furthermore, runoff increases after fires (Tiedemann *et al.* 1979) and storms may result in elevated stream flow and flooding of rock outcrops or other cover sites in or adjacent to streambeds. Ridge-nosed rattlesnakes at these cover sites could be drowned or washed downstream during a runoff event. Cover afforded by vegetation, woody debris, and leaf litter would recover over a period of years. Rock piles and talus slopes that are covered with silt may or may not recover their value as habitat. However, as hillsides erode, new outcrops and talus could be exposed (Barker 1991). Grasses would be expected to recover to pre-burn levels within three years (Cable 1967), but their recovery can be slowed significantly by livestock grazing. Dan Robinett (Natural Resource Conservation Service, Tucson, Arizona, pers. comm. 1996) recommends resting burned sites above 4,000 feet from grazing for a two year period to facilitate recovery.

The prey base of the New Mexico ridge-nosed rattlesnake would also be affected by fire, although those effects are complex and are dependent on the requirements of specific species and the characteristics of the fire (McPherson 1995). Fire in montane forests alters rodent communities (Tevis 1956, Biswell 1963, Irvine 1991,). Most small mammals live in burrows and are well-insulated from the direct effects of fire (McPherson 1995); however, Irvine (1991) documented post-fire declines in deer mice (*Peromyscus* spp.), populations at study sites on the Coconino National Forest in Arizona. She attributed these declines to reduced food supplies. Lowe *et al.* (1978) noted an increase in deer mice populations the first year after a fire in Ponderosa pine forest near Flagstaff, Arizona. However, small mammal diversity and densities are typically depressed for one to three years after a fire (Wright and Bailey 1982). Biswell *et al.* (1973) suggested that rodent populations would be less affected during fall fires, because at that time of year rodents have accumulated seed caches that will mitigate loss of food sources. Predation of surviving rodents and also lizards, that are part of the diet of the ridge-nosed rattlesnake, may increase immediately after the fire (Barker 1991).

The prescribed fire would be expected to alter avian populations, as well, with ground-foraging and nesting birds perhaps benefitting over species associated with trees or shrubs (Bendell 1974). The initial effect of the Maverick fire is likely to be detrimental to rodent and bird populations, as cover and plant forage species would be reduced. Many species of birds nest in May or June, and these nests would be lost. However, with the onset of the summer rains, ground cover and forage for prey items of the New Mexico ridge-nosed rattlesnake should increase with an associated recovery of prey populations.

A long-term objective of the prescribed fire includes reducing cover of woody plants and increasing cover by herbaceous plants (Helbing 1996). The effect of altering vegetation communities in this manner on the New Mexico ridge-nosed rattlesnake has not been investigated. However, Barker (1991) believed that the key habitat component for this subspecies was rock shelters and that the snake did not appear to be associated with specific plants or plant communities. He found the New Mexico ridge-nosed rattlesnake in a variety of plant communities in the Sierra San Luis. Although the subspecies occurs in several plant communities, Andrew Holycross (pers. comm. 1996) believes the snake is more abundant in partially shaded microsites and may benefit from cool, moist shelter sites. In the Animas Mountains the species is often found on talus slopes and outcrops overgrown with shrubs, in wooded, shady canyons; or on the vegetated edges of more open talus slopes. Thus, any long-term conversion of plant communities from woodland/shrubland to grasslands or other open communities may be detrimental to the rattlesnake. Andrew Holycross and Charlie Painter (pers. comm. 1996) believe that repeated, frequent fires in the habitat of this snake could be highly detrimental.

Habitat Destruction or Degradation, or Direct Mortality of Ridge-nosed Rattlesnakes Resulting From Fire Suppression Activities if the Fire Crosses the Secondary Fire Line:

No New Mexico ridge-nosed rattlesnakes have been found outside of the secondary fire line. However, the distribution of the subspecies in the Peloncillo Mountains is poorly understood and the subspecies could easily occur beyond the secondary fire line. If the fire escaped the secondary line, it would be suppressed if resources, property, or human safety were at risk. Fire suppression activities could include mobilizing fire crews to the area; building fire lines by hand or with heavy equipment, setting backfires; establishment of crew base camps, equipment staging areas, and aircraft landing and fueling sites; off-road vehicle use to access the fire; and use of aerially-applied fire retardants. Snakes could be killed or habitat destroyed or degraded by backfires. Construction of fire lines, crew base camps, staging areas, aircraft landing areas, and off-road vehicle use could all result in mortality to ridge-nosed rattlesnakes and destruction of habitat. Fire retardants may include water, an iron oxide slurry, a fugitive retardant made of phosphorus and red dye, or foams. With the exception of water, which is considered benign on the ridge-nosed rattlesnake, the effects of fire retardants on this snake or its habitat are unknown. Some forms of fire retardants act as fertilizers and may contribute to increased plant production after a fire (Bill Leenhoust, Fire Ecologist, Fish and Wildlife Service, Boise, Idaho, pers. comm. 1995).

Decreasing the Probability of Future, Devastating Wildfires

Based on historical accounts and dendrochronological analysis of fire scars in tree rings, inferences have been made from plant communities at upper elevations which suggest that due to livestock grazing and fire suppression during the last 50 to 125 years, fire frequency has decreased substantially in grassland and sky island forest communities of southeastern Arizona and southwestern New Mexico (Bahre 1991, Allen 1994, Fule and Covington 1994, Grissino-Mayer *et al.* 1994, Villanueva-Diaz and McPherson 1994). In the presettlement era, low-

intensity fires that removed small trees and ground fuels, but rarely killed mature trees, probably occurred at frequent intervals. Intense crown fires were rare events in upper elevation forests (Grissino-Mayer *et al.* 1994). With the exclusion of fire, young trees and shrubs form dense thickets and fuel loads have increased, making montane landscapes more susceptible to devastating fires (Fule and Covington 1994). In comparison to a low-intensity fire, intense fire, such as the one that swept through Barker's (1991) study site in the Sierra San Luis, is much more likely to eliminate cover, result in erosion and sedimentation, and produce intense heat that kills snakes in rock shelters.

Implementing the proposed action would reduce fuels and hopefully begin to restore a natural fire regime in which frequent, low-intensity fire would act to maintain a mosaic of grasslands, woodlands, and shrublands. These frequent, low-intensity fires would reduce the possibility of intense fires such as occurred in the Sierra San Luis.

Critical Habitat

Critical habitat has been designated only in the Animas Mountains. The proposed action does not occur near, nor would it affect critical habitat for the New Mexico ridge-nosed rattlesnake.

Effectiveness of Proposed Mitigation:

Not igniting the fire during periods when snakes are expected to be active would reduce the probability that animals will be directly killed by the fire. With implementation of mitigation measures three and four (page 6), most ridge-nosed rattlesnakes will be underground or deep in rock piles when the fire is ignited. These snakes will probably be safe from all but the most intense hot spots. Rainfall could occur after a decision to mobilize the fire, in which case some snakes could be on the surface when the fire is ignited. However, this scenario is unlikely to occur. If significant rainfall occurred after a decision to mobilize, the fire would be halted regardless because conditions would rapidly become to wet to achieve the fire's objectives. Not igniting the upper Miller Canyon area will reduce, but not eliminate, the possibility that this key area for the snake will burn. Fire could still burn into Miller Canyon from adjacent areas. The brush pile where three ridge-nosed rattlesnakes have been found could be destroyed. Heavy brush on the north-facing slope of Miller Canyon may burn intensely and kill some snakes that may be in talus slopes and rock piles there. Not blading new roads or fire breaks will reduce the potential for suppression-related habitat destruction and mortality of snakes. Resting burned areas from grazing for two summer growing seasons will facilitate vegetation recovery and reduce the potential for erosion.

Lesser Long-nosed Bat and Mexican Long-nosed Bat

The potential effects of the proposed Maverick Prescribed Fire to the lesser long-nosed bat and Mexican long-nosed bat would primarily be through the affects of the fire on the agave food plants utilized by the bats. The natural dynamics and composition of the vegetation communities within the project area have been altered through past fire control policies and livestock grazing.

How past land management activities have affected the agave distribution and abundance present today is unclear, as is the potential affects of returning a natural fire regime into an altered system.

The proposed project is a one-time prescribed fire to take place during the spring or early summer. Some of the objectives of the fire include reducing the shrub component of the vegetation community and increasing grass densities. Depending on the results of this fire, in part, a larger scale program to use recurrent fire as a land management tool is being undertaken. The potential effects of the larger fire program to the lesser long-nosed bat and Mexican long-nosed bat will be addressed in a separate consultation.

Reintroducing fire into desert grassland and oak/juniper savanna systems can have many benefits and may improve overall long-term "ecosystem management" objectives. Among these is the reduction of woody fuels which would decrease the possibility of intense fires and resulting erosion, soil sterilization, and increased plant mortality. Ultimately, if fire continues to be excluded from the system a major wildfire will occur with potentially devastating effects. Returning to a more natural regime of low-intensity fires would help to maintain a mosaic of grasslands, woodlands, and shrublands across the landscape. However, even under a prescribed fire regime there are potential adverse effects of fire to agaves which may affect resource availability for the lesser long-nosed bat, Mexican long-nosed bat, and many other species of vertebrate and invertebrate wildlife which use agaves and their flowers.

Palmer's agave typically occurs on rocky slopes, but is also scattered within the desert grassland and oak woodland communities within the elevation range of approximately 900 meters (3,000 feet) to 1,800 meters (6,000 feet) (Gentry 1982). Parry's agave reaches higher elevations than Palmer's, extending from grasslands into oak woodland, chaparral, and pine/oak forests, with an elevation range of approximately 1,500 meters (4,900 feet) to 2,500 meters (8,200 feet) (Gentry 1982). Like Palmers' agave, Parry's is typically found on rocky slopes (Gentry 1982). Within the project area, concentrations of paniculate agaves are primarily on the rocky, shallow soils of hills and ridges. Other Palmer's and Parry's agaves are found scattered in areas of deep, heavy soils where there are thick stands of shrubs and mesquite. The relative fuel loading and potential exposure of agaves to intense fire is lower on the rocky soils.

The ecology of Palmer's agave appears to be poorly understood, especially as it is affected by fire (Liz Slauson, pers.comm. 1997; Wendy Hodgson, Desert Botanical Gardens, Phoenix, Arizona, pers. comm. 1997). Agaves are perennial succulents. Agave seeds germinate readily with adequate moisture, typically in open areas with limited competition from other plants (Tony Burgess, Biosphere Two Center, Tucson, Arizona, pers. comm. 1997). Palmer's agave is relatively slow growing, often taking 20+ years before initiating the single reproductive event in the life of the plant (Liz Slauson, pers. comm. 1997). A flowering stalk erupts from the rosette of a mature plant, growing rapidly through the spring and early summer. During the summer 8 to 12 flowering panicles are displayed on the upper third of a stalk, 3 to 5 meters tall (Gentry 1982). Apparently there are many factors which influence the year a particular plant may bloom. Precipitation, one to several years prior to blooming, is probably of special

importance. In the nearby Baker burn area, approximately 2 percent to 5 percent of the agave population flowers each year (Peter Warren, The Nature Conservancy, Tucson, Arizona, pers. comm. 1997). Palmer's agave may occasionally produce off-sets (vegetative reproduction or cloning of "pups" produced from rhizomes) though this is less likely than for many other agave species (Wendy Hodgson, pers. comm. 1997). Parry's agave freely produces off-sets (Gentry 1982).

In comparison with other agaves, Palmer's agave may be more susceptible to fire induced mortality due to the fleshiness of its leaves and open rosette being exposed to other fuels (Wendy Hodgson, pers. comm. 1997). A previous prescribed fire, the Baker burn, was conducted in the vicinity of the proposed action. According to preliminary monitoring efforts conducted after that prescribed fire, there was a 7 percent to 11 percent mortality of Palmer's agaves that were exposed to fire (Peter Warren, pers. comm., 1997). Additional mortality may be accrued through the loss of the smallest, and least detectable size classes of agave. Thomas and Goodson (1992) reported an average mortality of 28 percent of five species of leaf succulents from nine field sites with records of both prescribed burns and wildfire in southern Arizona. Specific Palmer's agave mortality averaged 18 percent. However, post-fire grazing may have influenced reported mortality.

Agave mortality due to fire may affect the abundance and distribution of blooming agaves on the landscape for many years into the future, especially if there is high mortality within certain age/size classes (e.g seedlings). In addition, natural recruitment of agaves may be very episodic and the effects of fire on the agave seed bank in the soil are unknown.

Besides direct mortality of agaves, fire may alter the availability of blooming agaves and the quality of the floral resources (nectar and pollen). By early spring, an agave plant would have physiologically committed to bolt (send up a flowering stalk). If the plant is burned and lives, bolting continues though the flower stalk is smaller with fewer flowers and a lower nectar sugar content per flower (Howell 1996; Liz Slauson, pers. comm. 1997). If the stalk burns directly, the reproductive effort of that plant and the availability of flowers and nectar to *Leptonycteris* has been lost. A fire may actually stimulate flowering in adult agaves one to two years following a burn (Liz Slauson pers. comm. 1997). However, in subsequent years following the period of increased flowering there may be a reduced number of flowering agaves. The complexity of variables influencing agave flowering may mask the affects of a burn on agave flowering within several years of a fire.

Other affects to agaves from fire may be brought about through changes in the vegetation community. The proposed fire is to take place when environmental conditions are conducive for a hot fire in order to reduce shrub invaders (e.g. mesquite, juniper) and assorted half-shrubs (e.g. snakeweeds, *Gutierizzia* spp., burroweed, *Isocoma tenuisecta*). Sites on deeper soils often have denser shrubs and the potential of a hotter fire. Agaves in these locations would probably tend to suffer greater levels of direct mortality from the fire (Dave Gori, The Nature Conservancy, Tucson, Arizona, pers. comm. 1997). In addition, an increase in grass cover is one of the objectives of the proposed project. Deep soil sites would have a greater potential to

increase in grass density following reduction in shrub cover. Grasses are probably one of the strongest competitors with agave seedlings (Tony Burgess, pers. comm. 1997). There may be a reduction in agave seedling survivorship if the objective of increased grasses is achieved. Fire would have the potential to reduce the distribution of agaves within the project area. Whether a single fire would affect vegetation species composition to this degree is uncertain.

Due to the topographic and vegetational heterogeneity of the project area, a uniform fire over the area is not anticipated. Areas of rocky, shallow soils with limited fuel loading, where the highest densities of Palmer's and Parry's agaves typically occur, are not expected to thoroughly burn, nor to burn under intense heat. Fire ignition techniques will also be employed to facilitate a burn mosaic. The project objective is to accomplish a 35 percent to 60 percent burn over the project area. Therefore, the resulting burn mosaic should help to retain agave distribution throughout the project area.

Agave stalks, as they begin to bolt, are particularly palatable to domestic livestock and wild herbivores, including deer, javalina, rodents, and rabbits (Michelle Hawks, University of Arizona, Tucson, pers. comm. 1997; Wendy Hodgson, pers. comm. 1997). No long-term investigation has documented the influence of grazing on agave mortality or flowering stalk herbivory following fire. One month following a wildfire prior to the summer monsoons at Four Peaks on Tonto National Forest, livestock were observed eating the unprotected apex of several agave plants (Tricia Roller, U.S. Fish and Wildlife Service, Phoenix, Arizona, pers. comm. 1997). Since agaves often remain partially green, succulent, and available to herbivores when food resources are low immediately following a fire, they may be perferencially selected by herbivores. This may also affect the availability of agave flowering stalks to bats, and agave mortality without seedset.

Following the Maverick Prescribed Fire, the Forest will rest the area within the burn perimeter from domestic livestock use during at least two growing seasons to allow herbaceous ground cover to respond and establish. The Forest will re-evaluate if resting an additional growing season is warranted based on precipitation and forage production. Thus, the short-term, post-fire effects of livestock grazing on agave plants in the action area will be minimized. Yet, the long-term effects of livestock grazing on agave populations remain unclear (perhaps affecting an increase in certain agave species).

The factors that are important to *Leptonycteris* concern the availability of agave flowering stalks, each and every year. In southeast Arizona, Palmer's and Parry's agaves are the only reliable food resource for long-nosed bats in mid to late summer. However, agaves are patchily distributed over the landscape and the presence of flowering agaves naturally fluxuates from year to year. Nectar feeding bats are opportunistic foragers, taking advantage of local floral resources. During the breeding season lesser long-nosed bats may fly great distances in search of food resources, and latter in the season they may shift roost sites and foraging areas based on the presence (or absence) of flowering agaves (Yar Petryszyn, pers. comm. 1997). The distance the bats will forage from a roost site appears to be related to the size of the colony and the available floral resources (Virginia Dalton, pers. comm. 1997; Yar Petryszyn, pers. comm.

1997). *Leptonycteris* is only present in the project area after the bats have left their maternity colonies and migrated to southeast Arizona and southwest New Mexico in mid to late summer when agaves are in flower.

Superimposing the potential affects of fire frequency, intensity, and timing (season) as it affects the availability of floral resources (quality and quantity), adult plant mortality, and seedling mortality, upon the natural variability in agave phenology, episodic reproductive events, and patchy distribution on the landscape, may affect agaves and nectar feeding bats in a variety of ways. *Leptonycteris* bats are opportunistic foragers and are capable of long distance flights. Temporary and minor shifts in the abundances of flowering agaves as an available resource for these bats with the proposed Maverick Prescribed Fire which is considered as single event, should have limited adverse affects as the following assumptions are considered in the effects analysis:

- The proposed project encompasses a large area which will burn in a mosaic pattern;
- Areas of agave concentrations will tend not to burn, or will burn under low intensity fires;
- Fire will result in a minimum level of mortality of the agaves which actually burn;
- Fire will not substantially affect the availability of agave flowering stalks in the short-term; and
- Fire, and subsequent changes in the vegetation community, will not substantially affect the availability of agave flowering stalks over the long-term (including recruitment of agave seedlings).

The affects of major reductions in agave flower availability to *Leptonycteris*, even in only some years, and the long term affects of fire on the distribution and abundance of agaves on the landscape are uncertain. The potential affects of land management actions and the validity of the above assumptions need to be understood to best manage endangered long-nosed bats in the context of their ecosystem.

The Forest is currently cooperating in a multi-party effort to study the behavior and effects of fire on the landscape in the Peloncillo Mountains. This research is under the primary direction of the Forest Service Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. There are many other cooperators in this effort, including Natural Resources Conservation Service, Indiana State University, University of Arizona, The Nature Conservancy, and the Malapai Borderlands Group which is a coalition of local, private land owners.

In order to define the current state of knowledge on *Leptonycteris* and *Agave* ecology, their inter-relationships, and the related effects of fire, the Forest and The Nature Conservancy coordinated a meeting on January 15, 1997, of bat, agave, and fire experts as part of this consultation

process. The discussions in that meeting were very important in defining both concerns and opportunities to address agave distribution and abundance issues in relation to *Leptonycteris* foraging ecology, as part of a large-scale burn program. Several aspects of the research have been initiated prior to the 1995 Baker Fire in the Peloncillo Mountains and certain aspects of these efforts are being extended to the Maverick Prescribed Fire. Research underway and/or proposed on the Baker and/or Maverick prescribed fires includes the application of fire as a land management tool, how fire influences species and community ecology, and how fire behavior is influenced by local topographic and environmental conditions. Some of the research and monitoring studies carried out by the various partners in this collaborative effort include:

- The effect of prescribed fire on breeding and wintering bird diversity and abundance, and vegetation;

- How Palmer's agave is utilized by local nectar-feeding bats, birds, and insects; gathering basic ecological information on agave floral food rewards (nectar and pollen), levels of fruit and seed set, and how regularly flowering agaves are visited by bats. This information will be useful in assessing if prescribed burns in the Peloncillo Mountains are likely to significantly affect the food supply of borderlands bat populations;

- Fire behavior studies which relate fire effects to fuel complexes, burn pattern, terrain, topography, and regional climate; the mapping of fire spacial patterns;

- Establishing photographic monitoring plots;

- To define and delineate agave "core areas" within the burn perimeter to assess the immediate effect of fire on established agaves, and to begin agave demographic studies to assess long-term effects of fire on agave mortality, growth, recruitment, and flowering; and

- Agave habitat mapping and fire relations, including intensive mapping of agave core areas as it relates to fire behavior, terrain, and fuel properties on these potentially rockier and more exposed sites.

The results of various aspects of these studies may take several years before they are available. However, certain results may be available much sooner. Applying new information to land management decisions as it is developed is an important aspect of adaptive management. This same approach can be applied in reassessing the potential impacts of prescribed fire to long-nosed bats and their food plants. As we gain knowledge of how fire behaves on the landscape and the sum affect of that fire to agaves, the relative degree of any short-term or long-term adverse effects to long-nosed bats can be better defined and evaluated in regional context.

These collaborative efforts in research and land management actions among agencies, organizations, and private land owners represents an opportunity to understand, in part, the complex ecological relationships of fire in the desert grassland, oak savanna, and oak woodland

communities, and to manage these habitats on a landscape or ecosystem level. The long-term benefits of enhancing ecosystem processes, functions, and dynamics should equally contribute to resource sustainability and the long-term conservation and recovery of the long-nosed bats.

CUMULATIVE EFFECTS

Cumulative effects are those adverse effects of future non-Federal (state, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the "Environmental Baseline" and the "Status of the Species". Non-Federal actions in the United States that may result in a take of a listed animal species require a section 10(a)(1)(B) permit from the Service. Cumulative impacts of future state and private projects will be addressed through the section 10(a)(1)(B) permit process.

New Mexico Ridge-nosed Rattlesnake

The majority of potential habitat for the ridge-nosed rattlesnake in the Peloncillo Mountains are administered by the Coronado National Forest. Smaller areas are privately owned or administered by the Bureau of Land Management. Thus, few cumulative effects to this subspecies are anticipated in the Peloncillo Mountains. Habitat for this snake in the Animas Mountains and the Sierra San Luis is privately owned. No non-Federal actions that might occur in the Animas Mountains and that could affect the ridge-nosed rattlesnake are anticipated, except possible prescribed fire or escaped prescribed fire and its suppression. Livestock grazing occurs in the habitat of the ridge-nosed rattlesnake and may result in localized habitat degradation.

Lesser Long-nosed Bat and Mexican Long-nosed Bat

Although State land is included in the project area, the Service is not aware of future State actions that are reasonably certain to occur in the action area. In addition, there is private land that is included in the project area. One activity that probably is occurring on Federal, State, and private land within the project area is cattle grazing. Cattle grazing may have an adverse effect on the food resources of *Leptonycteris*. The extent to which cattle grazing has an effect on these bat species through impacts to paniculate agaves needs to be determined.

SUMMARY OF EFFECTS AND CONCLUSION

After reviewing the current status of the New Mexico ridge-nosed rattlesnake, lesser long-nosed bat, and Mexican long-nosed bat, the environmental baseline for the action area, the effects of the proposed Maverick Prescribed Fire, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of either the New Mexico ridge-nosed rattlesnake, lesser long-nosed bat, or Mexican long-nosed bat. Nor will the action result in adverse modification or destruction of critical habitat for the New

Mexico ridge-nosed rattlesnake. No critical habitat has been designated for the bat species. These findings are based on the following:

New Mexico Ridge-nosed Rattlesnake

1) Most New Mexico ridge-nosed rattlesnakes will be in rock shelters at the time of the fire. These shelters will protect most animals from direct death or injury.

2) The Maverick Prescribed Fire will facilitate resumption of a more natural fire regime wherein intense, destructive fires occur relatively infrequently.

3) Resting burned areas from livestock grazing for a minimum of two growing season following the prescribed fire will facilitate vegetation recovery.

4) The fire is expected to burn patchily, and the likelihood of fire in Miller Canyon, where five of nine snakes have been found in the Peloncillo Mountains, will be greatly reduced by not igniting the fire there.

5) No critical habitat has been designated in the Peloncillo Mountains.

Lesser Long-nosed Bat and Mexican Long-nosed Bat

1) The objective of the prescribed burn is to create a mosaic of burned areas within the ignited perimeter. A minimum of 35 percent of the area, to a maximum of 60 percent, is expected to burn. Areas with higher levels of dead and down woody fuels with abundant and continuous distributions of herbaceous material will burn more intensively and more continuously. Areas of dense agave stands appear to be more abundant on steep, shallow, rocky slopes with less woody fuels and will tend not to burn, or will burn under low intensity fire.

2) The Maverick Prescribed Fire will facilitate resumption of a more natural fire regime wherein intense, destructive fires occur relatively infrequently.

3) Resting burned areas from livestock grazing for a minimum of two summer growing seasons following the prescribed fire will facilitate vegetation recovery.

4) No critical habitat has been designated for the two bat species, thus none will be affected by the proposed burn.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits the take of listed species without special exemption. Taking is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harm is further defined to

include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of a listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with this incidental take statement.

The reasonable and prudent measures described below are nondiscretionary. The Forest has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest (1) fails to require any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

This biological opinion anticipates the following forms and amounts of take in regards to the proposed action:

New Mexico Ridge-nosed Rattlesnake

1) Two New Mexico ridge-nosed rattlesnakes in the form of direct mortality resulting from snakes killed or injured by fire, smoke, or heat.

2) Two New Mexico ridge-nosed rattlesnakes in the form of harm resulting from habitat alteration and destruction (decreased cover, initial declines in prey populations, and increased predation)

3) An unlimited number of New Mexico ridge-nosed rattlesnakes in the form of harassment, to capture and move animals out of harm's way in the case of snakes found during the fire. The Service anticipates that this form of take would be most likely to occur if the fire escaped the secondary fire line and fire crews were dispatched to suppress the fire.

Lesser Long-nosed Bat and Mexican Long-nosed Bat

The Service anticipates incidental take of lesser long-nosed bats and Mexican long-nosed bats will be difficult to detect for the following reason(s): the species are wide-ranging and may use more than one roost; they have a small body size; finding a dead or impaired individual is unlikely; losses may be masked by seasonal use of roosts; and the species occurs in habitat that

makes detection difficult. However, the following level of take in the form of harm (habitat modification) to these species can be anticipated from the proposed project.

1) No more than 60 percent of the project area is to actually be burned.

2) No more than 20 percent of the agaves that are burned are to be killed by the fire.

This biological opinion does not authorize any form of take not incidental to the Maverick Prescribed Fire as described herein. If the incidental take authorized by this opinion is met, the Forest shall immediately notify the Service in writing. If the incidental take authorized by this opinion is exceeded, the Forest must immediately reinitiate consultation with the Service to avoid a violation of section 9 of the Act. In the interim, the Forest must cease the activity resulting in the take if it is determined that the impact of additional taking will cause an irreversible and adverse impact on the species. The Forest should provide to this office an explanation of the cause of the taking.

EFFECT OF THE TAKE

In this biological opinion, the Service finds that this level of anticipated take is not likely to jeopardize the continued existence of either the New Mexico ridge-nosed rattlesnake, lesser long-nosed bat, or Mexican long-nosed bat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the incidental take authorized by this biological opinion:

New Mexico Ridge-nosed Rattlesnake

1) Personnel education/information programs and well-defined operational procedures shall be implemented.

2) The fire shall not be ignited in known, key habitat of the ridge-nosed rattlesnake.

3) Except as necessary during emergency fire suppression, no new roads or fire breaks shall be bladed.

4) The fire shall not be ignited if New Mexico ridge-nosed rattlesnakes are expected to be active on the surface.

5) If fire suppression is initiated, suppression activities shall be carried out in a manner to reduce potential adverse effects to the New Mexico ridge-nosed rattlesnake and its habitat; including moving individual snakes out of harm's way if they are encountered by fire crews.

6) Actions shall be taken to facilitate recovery of vegetation.

7) The Forest shall monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring.

Lesser Long-nosed Bat and Mexican Long-nosed Bat

1) The Forest will implement the proposed project in a manner that will create a mosaic of burned and unburned fuels within the ignited perimeter and minimize direct mortality of agave plants from the Maverick Prescribed Fire.

2) The Forest will monitor the effects of the Maverick Prescribed Fire on agave populations in the project area.

3) The Forest will continue to coordinate with agencies and individuals knowledgeable on the ecology of nectar-feeding bats, paniculate agaves, and the effects of fire, and help to implement appropriate management actions as new information becomes available.

4) The Forest shall monitor incidental take resulting from the proposed action as it relates to the extent of area burned within the ignited perimeter and percent mortality of burned agaves one year (two growing seasons) following completion of the Maverick Prescribed Fire. These findings are to be reported to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, The Forest must comply with the following terms and conditions. These terms and conditions implement the reasonable and prudent measures described above and are nondiscretionary with the following exceptions. In the case of fire suppression activities, the Incident Commander or Incident Management Team, in consultation with the Resource Advisor, may elect not to implement specific terms and conditions if their implementation would place personnel or property in immediate danger, or delays caused by implementation would compromise efforts to protect habitat of a listed species. These specific terms and conditions are: New Mexico Ridge-nosed Rattlesnake 1a, 3a, 5a, 5c, 5d, 5g, and 5h. All other terms and conditions are nondiscretionary. Terms and conditions: New Mexico Ridge-nosed Rattlesnake 2a, 3a, 4a, and 4b, and lesser long-nosed bat 1a, 1b, and 1c are adapted from the Coronado National Forest's project description.

New Mexico Ridge-nosed Rattlesnake

1) The following term and condition implements reasonable and prudent measure number 1:

a. All field personnel who implement any portion of the proposed action shall be informed of regulations and protective measures as described herein for the New Mexico ridge-nosed rattlesnake, lesser long-nosed bat, and Mexican long-nosed bat. All field

personnel shall be informed that intentional killing, disturbance, or harassment of threatened or endangered species is a violation of the Act and could result in prosecution. All personnel shall be advised that care should be exercised when operating vehicles in the project area to avoid killing or injuring snakes on roads.

2. The following term and condition implement reasonable and prudent measure number 2:

   a. No fire ignition shall occur in Miller Canyon (from the confluence of Miller Canyon and Cloverdale Creek west to the ridgeline of the Peloncillo Mountains, and from ridgeline to ridgeline within the canyon).

3. The following term and condition implements reasonable and prudent measure number 3:

   a. No new roads or fire breaks shall be bladed.

4. The following terms and conditions implement reasonable and prudent measure number 4:

   a. Before July 15, a decision to ignite the fire shall not occur within seven days of a rainfall event in either the primary or secondary burn areas (Figure 1). If rainfall occurs after a decision to mobilize the fire, ignition will occur only if the effort cannot be halted without incurring significant expense.

   b. The prescribed fire shall not be ignited after July 14.

5. The following terms and conditions implement reasonable and prudent measure number 5. Terms and conditions 5.a. through 5.j. only apply to suppression activities and personnel working in areas above 1,700 meters (5,570 feet) elevation (the presumed habitat of the rattlesnake).

   a. All personnel on the fire shall be informed and educated about the New Mexico ridge-nosed rattlesnake and the importance of protecting habitat and minimizing take.

   All personnel shall be instructed to contact the Resource Advisor (defined in the next term and condition) if a New Mexico ridge-nosed rattlesnake is encountered. Personnel other than the Resource Advisor shall not handle, move, capture or interfere with the movements of any ridge-nosed rattlesnake unless the snake is in immediate danger from the fire. Any equipment operation or other activities that may result in harm to a New Mexico ridge-nosed rattlesnake shall cease pending action by the Resource Advisor.

   b. A Resource Advisor(s) shall be on the fire during all suppression activities. Resource Advisors shall be qualified biologists designated to coordinate New Mexico ridge-nosed rattlesnake concerns and serve as an advisor to the Incident Commander/Incident Management Team. They shall also serve as field contact representatives responsible for coordination with the Service. They shall monitor fire suppression activities to ensure

protective measures endorsed by the Incident Commander/Incident Management Team are implemented. Resource Advisors shall be on call 24 hours in case the prescribed fire escapes the secondary fire line.

c. If a ridge-nosed rattlesnake is encountered during the fire, a Resource Advisor shall be called to the scene as soon as possible. The Resource Advisor shall assess potential harm to the individual snake. If the snake is in harm's way and project activities cannot be modified so as to avoid disturbance to it, the snake shall be moved by the Resource Advisor, or personnel briefed by the Resource Advisor on how to move snakes, no more than 60 meters (200 feet) to a nearby rock shelter or other site where it will be reasonably safe from fire or suppression activities. The Resource Advisor shall be allowed some discretion to ensure that survival of ridge-nosed rattlesnakes is likely. If, in the judgement of the Resource Advisor, no reasonably safe site exists within 60 meters of the encounter site, the snake shall be captured and held for later release. Animals shall be transported off-site as soon as possible in an air-conditioned vehicle. The Service shall be contacted as soon as possible concerning disposition of the snake. No handling or capture of snakes shall occur without an appropriate State permit.

d. The Resource Advisor shall maintain a record of any New Mexico ridge-nosed rattlesnakes encountered during project activities. This information shall include for each snake:

- The location, date, and time of observation;
- General condition and health, including injuries and state of healing;
- Location moved from and location moved to.

e. Off-road vehicle activity shall be kept to a minimum. Vehicles shall be parked as close to roads as possible, and vehicles shall use wide spots in roads or disturbed areas to turn around. If off-road travel is necessary, local fire-fighting units should go off-road first because of their prior knowledge of the area.

f. An objective of fire suppression strategies shall be the protection of key New Mexico ridge-nosed rattlesnake habitats, including Miller Canyon, Cottonwood Canyon, Whitmire Canyon, and other areas determined by the Resource Advisor.

g. Use of tracked vehicles shall be restricted to improving roads or constructing lines where a short distance of line might save a large area from fire.

h. Fingers or patches of unburned vegetation within burned areas shall not be burned out as a fire suppression measure, except as needed to secure the fire perimeter or provide for firefighter safety.

i. The Forest shall, to the extent possible, obliterate vehicle tracks made during the fire, especially those of tracked vehicles.

j. Areas disturbed for crew camps, landing strips, staging areas, and any other new areas of disturbance created during the fire shall be kept to the minimum area possible and shall be located in previously disturbed sites whenever possible.

6. The following terms and conditions implement reasonable and prudent measure number 6, and apply only to areas above 1,700 meters (5,600 feet):

a. Areas disturbed during fire suppression or other activities, such as access routes, fire lines, crew camps, landing strips, and staging areas shall be rehabilitated, including prohibiting vehicular access to newly disturbed sites and facilitating vegetation restoration through seeding or other means.

b. To facilitate vegetation recovery, livestock grazing shall be removed from burned areas during at least two monsoon seasons following implementation of the fire.

7. The following terms and conditions implement reasonable and prudent measure number 7:

a. A qualified biologist shall monitor and assess fire effects in Cottonwood Canyon and upper Miller Canyon. A survey of burned areas in upper Miller Canyon shall be conducted as soon as possible after the fire to look for live, injured, or dead rattlesnakes. Disposition of any injured or dead rattlesnakes found shall be in accordance with the section "DISPOSITION OF DEAD, INJURED, OR SICK NEW MEXICO RIDGE-NOSED RATTLESNAKES"

b. By October 31 following the fire, the Forest shall submit a monitoring report to the Arizona Ecological Services Office. The report shall briefly document fire suppression, rehabilitation, and monitoring activities during and after the Maverick prescribed fire. The report shall document the areas and acreage burned, extent of any suppression activities, the effectiveness of these terms and conditions, information about ridge-nosed rattlesnakes encountered, as indicated in term and condition 5.d., and any post-fire rehabilitation or monitoring activities conducted or planned. The report shall make recommendations for modifying or refining these terms and conditions to enhance protection of the New Mexico ridge-nosed rattlesnake.

Lesser Long-nosed Bat and Mexican Long-nosed Bat

1) Terms and conditions for reasonable and prudent measure 1.

a. The Forest will follow guidelines in conducting the fire in such a manner that the total area burned within the ignited perimeter of the Maverick Prescribed Fire will not exceed 60 percent.

b. The Forest will follow guidelines in conducting the fire in such a manner that mortality of agaves as a result of the Maverick Prescribed Fire will not exceed 20 percent of those agaves burned.

c. The Forest will not initiate ignition of the Maverick Prescribed Fire after July 14, to protect agave flower stalks as they become fully emerged from the basal rosette.

2) Terms and conditions for reasonable and prudent measure 2.

a. The Forest will establish at least three permanent agave demographic monitoring plots in areas of high agave density. Two of the plots will be in areas that are burned and one will serve as a control plot in an unburned area. The Forest will monitor phenology of agave flowering (flower stalk counts), agave mortality after the burn, and agave recruitment after the burn (sub-plot sampling within the permanent plots). The Forest will monitor these plots annually for a period of at least five years. After five years, the Forest, the Service, and Forest Service Research Unit will determine any additional monitoring needs.

3) Terms and conditions for reasonable and prudent measure 3.

a. The Forest will coordinate with, and assist to the greatest extent possible, the Arizona Game and Fish Department and New Mexico Fish and Game Department in reference to surveys for nectar-feeding bats and their roosts in southeastern Arizona and southwestern New Mexico.

b. The Forest will organize and conduct two meetings to discuss the results of the Maverick Prescribed Fire. The first meeting is to be held before December 1 of the year of the burn to review if/how objectives of fire implementation were met for the Maverick Prescribe Fire and how the burn area is beginning to respond. This meeting should include, at a minimum, Forest and Service personnel as well as other primary cooperators. The second meeting will occur before December 1, in the year following the burn to discuss results of initial monitoring efforts and the implications to long-nosed bat conservation. This meeting should include individuals and agencies knowledgeable on the ecology of nectar-feeding bats, paniculate agaves, and the effects of fire. The meeting is intended to examine all information that is relevant to the issue of effects of fire on nectar-feeding bats. Results of this meeting will be distributed to all appropriate entities. The need for additional meetings will be discussed, and organized by the Forest at their discretion.

4) Terms and conditions for reasonable and prudent measure 4.

a. The Forest shall monitor incidental take resulting from the proposed action as it relates to the extent of area burned within the ignited perimeter and percent mortality of

burned agaves one year (two growing seasons) following completion of the Maverick Prescribed Fire. Mortality monitoring will be conducted in late summer of the year following the burn. A report documenting the percent of area burned will be submitted to the Service by October 31 in the year of the prescribed fire (this may be included in the report required under terms and conditions 7b for the rattlesnake); a report on agave mortality from the fire will be submitted to the Service by December 1 of the year following the implementation of the fire.

DISPOSITION OF DEAD, INJURED, OR SICK NEW MEXICO RIDGE-NOSED RATTLESNAKES, LESSER LONG-NOSED BATS, AND MEXICAN LONG-NOSED BATS

Upon locating a dead, injured, or sick New Mexico ridge-nosed rattlesnakes, lesser long-nosed bats, or Mexican long-nosed bats, initial notification must be made to the Service's Law Enforcement Office, Federal Building, Room 8, 26 North McDonald, Mesa, Arizona, (Telephone: 602/261-6443) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. If possible, the remains of intact ridge-nosed rattlesnakes, lesser long-nosed bats, or Mexican long-nosed bats shall be placed with educational or research institutions holding appropriate State and Federal permits. If such institutions are not available, the information noted above shall be obtained and the carcass left in place.

Arrangements regarding proper disposition of potential museum specimens shall be made with the institution prior to implementation of the action. Injured animals should be transported to a qualified veterinarian by an authorized biologist. Should any treated rattlesnakes, lesser long-nosed bats, or Mexican long-nosed bats survive, the Service should be contacted regarding the final disposition of the animal.

CONCURRENCES

An August 26, 1996, letter was sent by the Service to the Forest which concurred with the Forest amended, June 5, 1996, finding that the proposed Maverick Prescribed Fire is not likely to adversely effect the jaguar, Mexican gray wolf, jaguarundi, and ocelot. The Service can concur with this finding based on the burning techniques associated with conducting a low intensity burn within or near riparian areas which are important corridors used by such wide ranging mammals. The aforementioned burning techniques are described and illustrated in the Project Description section of this biological opinion.

A complete record of discussion regarding areas of potential habitat and published account for the Mexican spotted owl within the proposed project can be found in the June 4, 1996, and August 26, 1996, letters written by the Service. Potential habitat for this subspecies in southern Arizona exhibits a dense gallery forest structure in riparian areas which generally occur in oak woodlands. Clanton Draw is a deep riparian canyon which occurs along an east facing slope within the project perimeter and demonstrates these characteristics. New Mexico Ornithological Society Field Notes (Volume 20, Number 1) report a spotted owl which was heard in Clanton Draw on February 7, 1981. The Service considers Clanton Draw to be potential habitat for the Mexican spotted owl.

Potential habitat and effects associated with the proposed project to the spotted owl were discussed at two meetings, held September 26, 1996 and October 12, 1996. A summary and follow up letter was written by the Forest on November 7, 1996, which provided detailed information on activities associated with the prescribed burn and Clanton Draw. Ignition sites nearest the canyon will generally be placed west of a ridgeline which will serve to separate the ignition areas from the east facing canyon. The downslope potential habitat occurs approximately one mile away from the ridgeline. Ignition sites are illustrated on Figure 1. If a incidental ignition were to occur east of the ridgeline a backing fire with the flame front facing in a westward direction would be the type of expected fire behavior. Such a fire would move very slowing and the chance of it spreading over a one mile distance is insignificant and discountable. Due to up-slope air movement and the ignitions primarily occurring west of the ridgeline above Clanton Draw, it is unlikely smoke will move into potential habitat. Helicopters used to ignite the burn will also be situated west of the ridgeline and noise caused by the activity will be minimized. Supported by the above information, the Service concurs with the forest determination of may affect, not likely to adversely affect the Mexican spotted owl.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2(c) or 7(a)(1) responsibilities for the New Mexico ridge-nosed rattlesnake, lesser long-nosed bat, or Mexican long-nosed bat. In furtherance of the purposes of the Act, we recommend implementing the following actions:

1. The Forest should initiate programmatic formal consultation on objectives for prescribed fire and fire suppression activities in the Peloncillo Mountains. The Forest should work with the Service to develop fire management objectives that are consistent with the recovery of the New Mexico ridge-nosed rattlesnake, Mexican spotted owl, lesser long-nosed bat, Mexican long-nosed bat, and other listed species that occur or may occur in the Peloncillo Mountains.

2. The Forest should initiate studies to determine the effects of chemical fire retardants on the New Mexico ridge-nosed rattlesnake and its habitat.

3. Because of the potential for destructive crown fire and loss of shrub and woodland habitat valuable to the New Mexico ridge-nosed rattlesnake, the Forest should burn higher elevation vegetation communities during the fall. A fall fire would burn cool, clearing out fuels but not threatening woodlands that are very scarce in the Peloncillo Mountains.

4. The Service understands that the Rocky Mountain Forest and Range Experiment Station will be conducting and coordinating research relevant to the bat/agave/fire issue. These studies will include examination of the behavior of fire, fire effects, and mapping of burn areas, and the interaction of Palmer's agave with nectar-feeding bats. These are very important issues and the Forest should continue their support of the efforts of the Research Unit to the greatest extent possible, through coordination, logistical support, or any other appropriate opportunity. The Forest should continue to use the results of this, and any other research project, as it can be applied, as appropriate, to adaptive land management decisions. Please provide the Service with the results of these research activities as they become available as well as any suggested applications of the studies.

5. The Forest should continue to coordinate and support, to the greatest extent possible, the monitoring of the status of the *Leptonycteris* roost that is known to exist in the Animas Mountains. Please provide the Service with any information received about that roost.

6. While conducting the agave monitoring outlined in Terms and Conditions 2a for the long-nosed bats, the Forest should monitor the presence of exotic grass species, specifically, Lehmann lovegrass and buffelgrass, and how prescribed fire may influence the spread of these species. Please include information on the presence of these exotic species in the agave monitoring report.

If the Forest implements the third Conservation Recommendation and postpones the fire, the Service anticipates that this biological opinion could be promptly amended to accommodate that change in the project description. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitat, the Service requests notification of the implementation of any conservation recommendations.

CLOSING STATEMENT

This concludes formal consultation on the Maverick Prescribed Fire in the Peloncillo Mountains, Arizona/New Mexico. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may adversely affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the

agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by this action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. Any questions or comments should be directed to Jim Rorabaugh, Bruce Palmer, Tricia Roller, or Tom Gatz of my staff.

Sincerely,

Sam F. Spiller
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM
Field Supervisor, Fish and Wildlife Service, Albuquerque, NM
State Director, Bureau of Land Management, Phoenix, AZ
State Conservationist, Natural Resource Conservation Service, Phoenix, AZ (Attn: Ron Bemis)
Team Leader, U.S. Forest Service: Rocky Mountain Forest and Range Experiment Station, Ft Collins, CO (Attn: Carl Edminster).

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Peter Warren, Field Representative, The Nature Conservancy, Tucson, Arizona.
Bill MacDonald, President, Malapai Group

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